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SESSION ID: LAB1-T09

Attacking and Defending Kubernetes: Privilege Escalation & Lateral Movement

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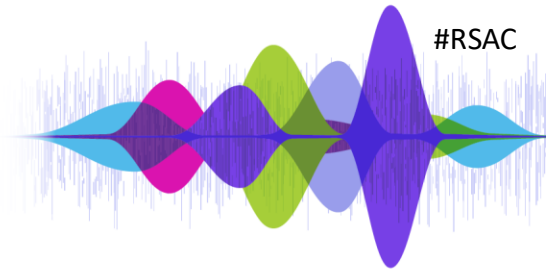

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Getting Started

10 minutes

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- Follow the Getting Started instructions to connect to the OpenVSCode server
- The facilitator will provide you with a link to access the SmartProxy configuration file

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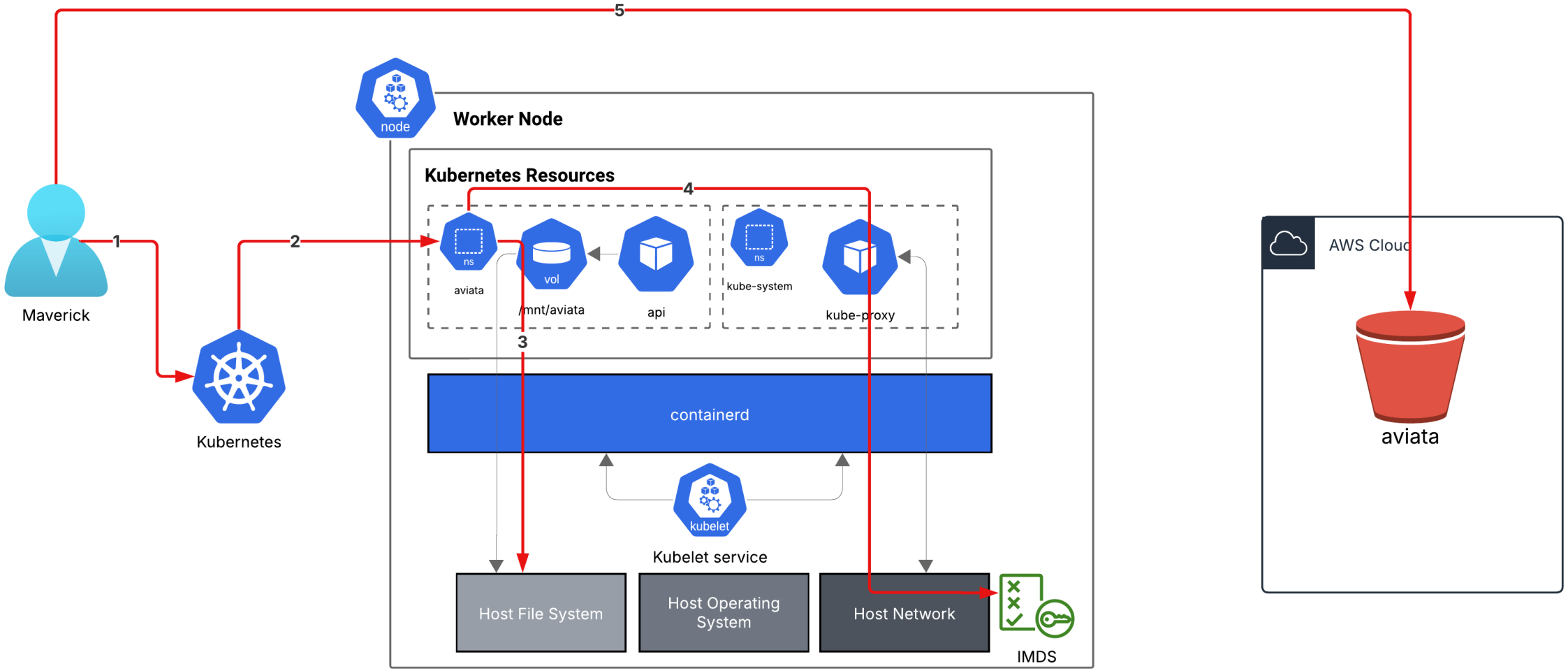
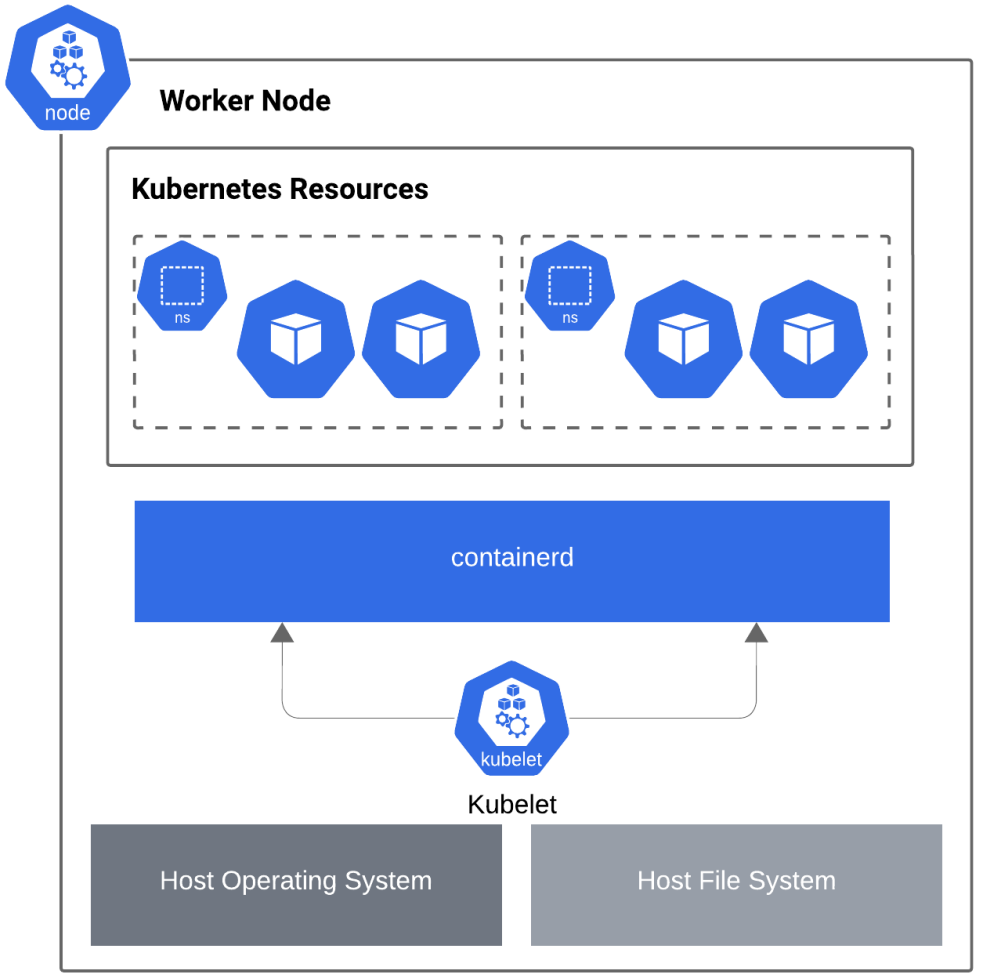
Learning Lab Goals



Kubernetes Node Components

- Kubernetes worker nodes run a host operating system (e.g., Google COS, Amazon Linux 2, Amazon Ubuntu, RHEL) and a container runtime
- Container runtimes, containerd, provide isolation for containers running on the worker node
- Kubernetes resources are managed by the kubelet running on the host through containerd
- Pods directly using the host's namespace or file system can bypass container security controls



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Host Path Mount Misconfiguration

- Identify the pod using a host path mount
- Find the Shadowhawk passphrase on the node's file system

15 minutes

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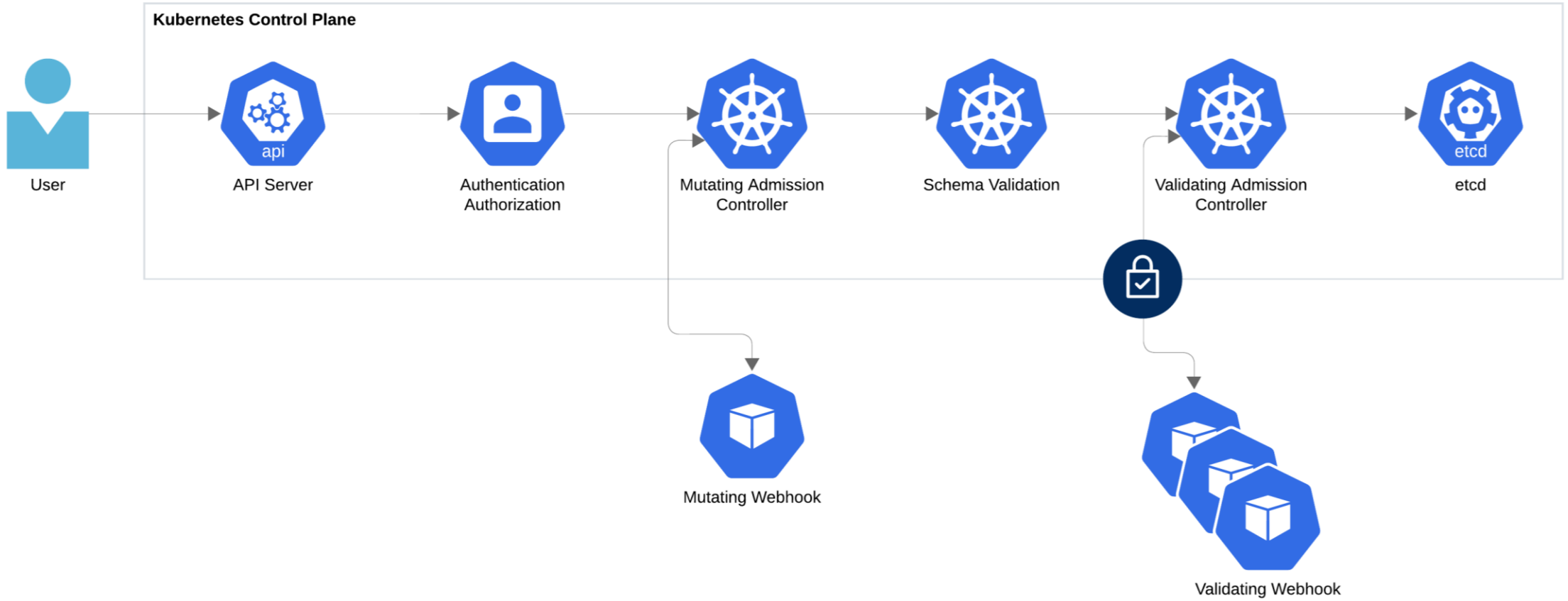
Kubernetes Admission Controllers

Deploy a validating admission controller that blocks the overly scoped host path mount configuration:



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OPA Gatekeeper Constraints

30 minutes

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- Install the gatekeeper library constraint templates
- Create a constraint that prevents the host path mount configuration

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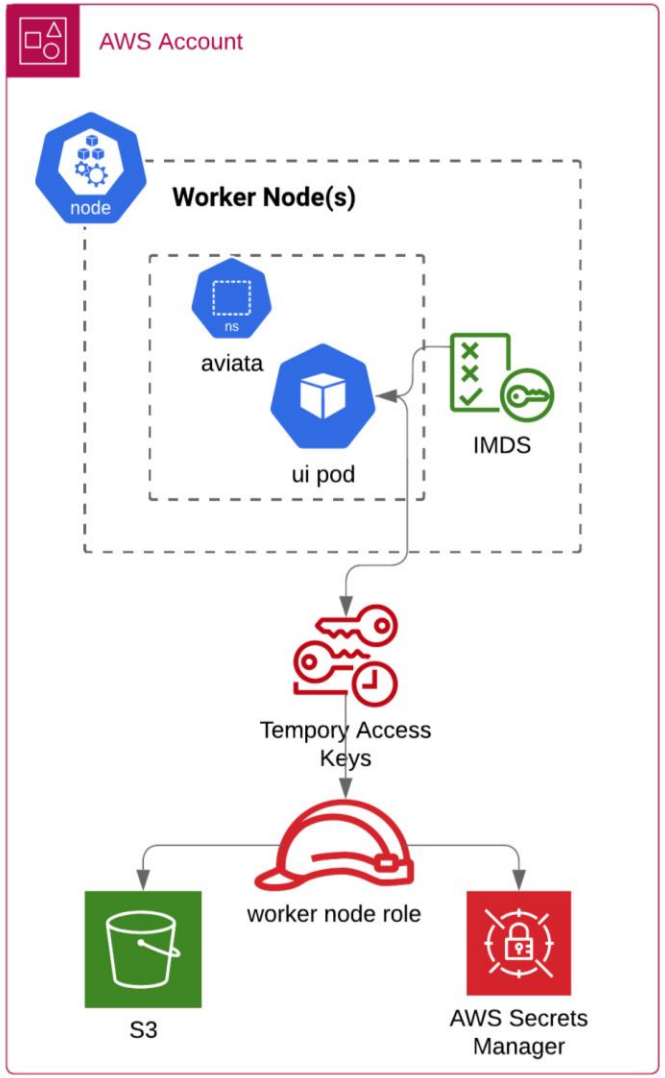
Pod Permission Inheritance

- Cloud managed nodes need permissions to manage network resources (interfaces, load balancers, IP addresses, etc.)
- Service accounts are attached to cloud virtual machines to grant these permissions to the Kubelet and other *kube-system* pods running on the node
- Workloads (Web, API) inherit these permissions by default through the node's instance metadata service (IMDS)



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Pod Permission Inheritance

15 minutes

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- Obtain temporary credentials from the node's instance metadata service
- Use the node's temporary credentials to exfiltrate the Shadowhawk startup code from S3

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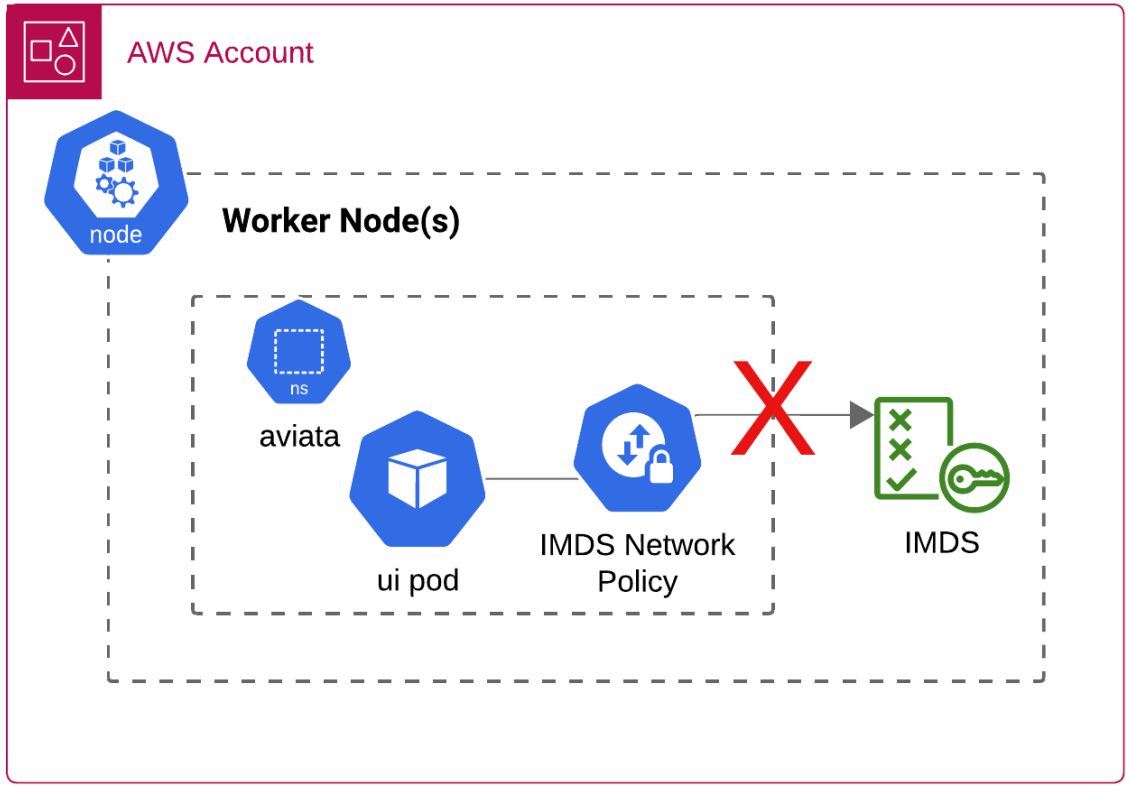
Calico Network Policy Enforcement

- Calico network policy extends Kubernetes policy with several advanced features:
  - Rule priority, deny rules, identity-based match options
  - Multiple types of endpoints including pods, VMs, and host interfaces.
- Write a Calico network policy that denies access to the node's IMDS



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Calico Network Policy Enforcement

30 minutes

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- Write a Calico network policy that denies access to the node's instance metadata service
- Verify that the pods can no longer access the IMDS

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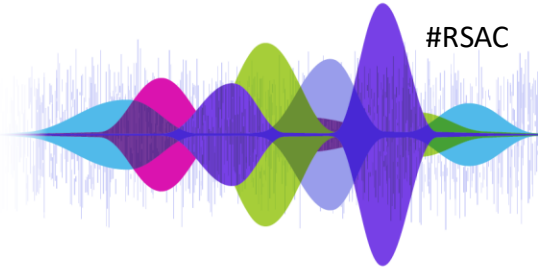
Apply What You Have Learned Today



- Next week you should:
  - Search clusters for overly scoped host path volume mounts
  - Audit pod access to the IMDS for privilege escalation issues
- Within three months, you should:
  - Deploy admission controllers blocking dangerous misconfigurations
- Within six months, you should:
  - Deploy network policy restricting east/west and egress pod traffic

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Thank you for attending!

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